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Acute respiratory disease as a fulcrum point to quit smoking: Evaluation of an ED-based intervention

Smoking cessation in ED patients

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Abstract

Aim: This study evaluated the effectiveness of a structured smoking cessation intervention and its relationship with nicotine dependence in smokers presenting to the emergency department (ED) with acute respiratory infections (ARI).

Materials and Methods: A single-center, prospective, randomized controlled trial was conducted. Participants (adults with ARI) were randomized to a control group (standard medical care) and an intervention group (standard care + structured smoking cessation counseling). Nicotine dependence was measured by the Fagerström Test of Nicotine Dependence (FTND). Smoking cessation rates were analyzed after one week and one month.

Results: The mean age of the 288 participants was 45 years (± 19.09 SD), and 72.6% (n = 209) were male. The smoking cessation rate was 45.7% (n = 21) in the intervention group and 7.3% in the control group (at one-month follow-up, $p < 0.001$). While high FTND scores negatively affected smoking cessation rates ($p < 0.001$), cessation rates were significantly higher in individuals with low FTND scores in comparison to those with high scores. 21.2% (n = 61)of the participants stated that they decided to quit smoking on the same day.

Discussion: Structured smoking cessation interventions may prove effective in increasing smoking cessation rates in these adult patients with ARI in the emergency setting. However, more comprehensive support programs are needed for individuals with high addiction levels.

Keywords

Smoking Cessation, Emergency Department, Fagerström Test, Intervention Programs, Nicotine Dependence

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Introduction

Smoking is one of the leading preventable causes of death worldwide and an important risk factor in the emergence of many chronic diseases, especially respiratory diseases [1]. Tobacco use remains one of the leading causes of preventable deaths worldwide, with global smoking prevalence showing only a modest decline in recent decades despite various control measures [2]. Smoking affects not only the health of individuals but also public health and the economic burden on healthcare systems.

The Centers for Disease Control and Prevention (CDC) defines "current smokers" as those who have smoked 100 or more cigarettes in their lifetime and continue to smoke. The CDC further defined smoking cessation from 1991 onwards as not using cigarettes for one day or more, although earlier definitions were based on attempts to quit [3]. In 2024, a study classified those who had quit smoking as individuals who had not smoked for at least 12 months [1].

Emergency departments (EDs) are critical referral centers for individuals with smoking-related health problems. These individuals are often motivated to change their smoking habits, particularly during acute respiratory infections (ARI). The American College of Emergency Physicians (ACEP) recommends smoking cessation counseling for smokers treated for ARI in EDs, though many emergency physicians consider smoking cessation outside their professional responsibilities [4–6].

Nicotine dependence (ND) severity plays a significant role in smoking cessation success. The Fagerström Test for Nicotine Dependence (FTND) is widely used to measure ND levels [7]. In Turkey, the reliability and validity of the test were studied by Uysal et al. [8]. Personalized interventions based on ND levels are crucial in increasing cessation success. Higher addiction levels may require nicotine replacement therapy and regular follow-up, while moderate addiction might benefit from behavioral therapies.

The 5A model (Ask, Advise, Assess, Assist, and Arrange), widely recommended for smoking cessation in clinical practice, has demonstrated effectiveness even in high-paced healthcare settings [9]. This study aims to evaluate the effectiveness of structured interventions on smoking cessation in ARI patients in EDs and follow up for one month.

Materials and Methods

This study has a single-center, prospective, randomized controlled design and was conducted over four weeks between November 10, 2016, and December 8, 2016.

A total of 20,928 patients presented to the ED during the specified period, and 2,018 of these patients were evaluated with acute respiratory complaints and diagnosed with ARI. Of the patients admitted with ARI, 541 reported active smoking. Exclusion criteria included individuals under 18 years of age, ASA class III-IV, pregnancy or breastfeeding, communication difficulties such as language barrier or cognitive impairment, psychotic behaviors or history of psychiatric treatment, and initiation of smoking cessation treatment. A total of 253 individuals meeting the exclusion criteria were excluded, and the final analysis was performed on 288 patients (Figure 1).

Demographic characteristics (age, gender, education level, income) and smoking-related data (age at initiation, number of cigarettes smoked per day, longest smoking cessation period) were recorded in detail. The level of smoking dependence was measured using the FTND. The randomization process of the patients was conducted using a computer-generated random allocation method, ensuring that all patients were assigned to either the intervention or control group with an equal probability. Blinding and allocation concealment were not performed because of the interventions included in the study procedure. Group A, which included standard care and diagnostic procedures, and Group B, which received structured interviewing and smoking cessation support. The structured support in Group B followed the World Health Organization (WHO) 5A model (Ask, Advise, Assess, Assist, Arrange). All participants were followed up by telephone at one week and one month to collect information about their smoking status, quit attempts, and general health status.

Statistical Analysis

The collected data were analyzed using SPSS 16.0 software. Descriptive statistics were used to describe continuous variables. Comparisons of more than two independent and normally distributed continuous variables were made with the Kruskal-Wallis test, and the comparison of two independent and non-normally distributed variables was made with the Mann-Whitney U test. Independent sample t-test was used for continuous variables, and the Chi-Square or Fisher's exact test was used for categorical variables. $P < 0.05$ was accepted as the level of statistical significance.

*Ethical Approva*l

This study was approved by the Ethics Committee of Haydarpaşa Numune Training and Research Hospital (Date: 2016-10-10, No: 2016-KK-104).

Results

A total of 288 patients were evaluated in the study. The mean age of the included patients with ARI was 45 ± 14 years, and the age range was between 18 and 90 years. The female population constituted 27.4% (n = 79) of the participants. The mean age of women was 44 ± 19.09 years, as opposed to 45 ± 19.09 years in men. A history of chronic systemic disease was present in 27.1% (n = 78) of the participants. The majority of the patients, 66.7% (n = 192), were individuals with an active working life. Among active smokers, 77.8% (n = 224) had a family history of active smoking.

Regarding daily cigarette consumption, 11.1% (n = 32) smoked 1-10 cigarettes every day, while 54.9% (n = 158) of the patients who participated in the study smoked 11-20 cigarettes. In addition, 20.8% (n = 60) of the patients consumed 20-30 cigarettes, while 13.2% (n = 38) smoked 30 or more cigarettes daily (Table 1).

A majority (70.8%, n = 204) of the participants stated that they had thought about quitting smoking at some point in their lives. Additionally, 21.2% (n = 61) stated that they decided to quit smoking on the day they participated in the study. Of those who decided to quit smoking on the day of participation, 50.7% (n = 31) attempted to quit smoking.

At the follow-up one week later, 16% (n = 46) had completely quit smoking, 18.4% (n = 53) had reduced their cigarette

consumption, 7.3% (n = 21) had quit for at least one day but relapsed, and 56.9% (n = 164) continued smoking.

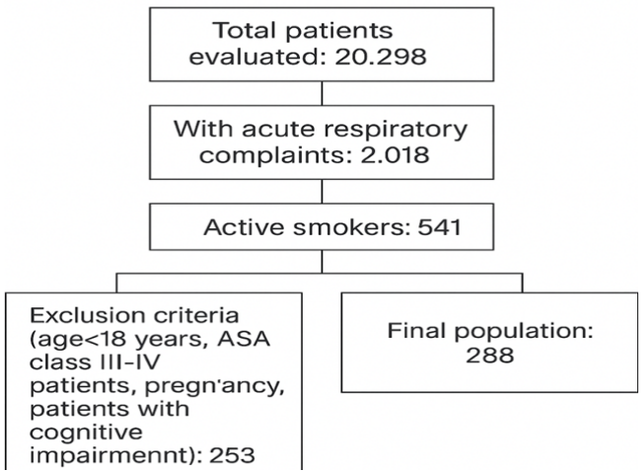
Table 1. Demographic and clinical characteristics of the patients participating in the study (statistical form)

Variable	n (%)/Mean ± SD
Total number of patients	288
Average age (years)	45 ± 14
Age range (years)	18 and 90
Number of female patients (%)	79 (27.4%)
Number of male patients (%)	209 (72.6%)
Mean age of women (years) ± SD	45 ± 7.33
Mean age of men (years) ± SD	44 ± 11.93
Positive history of chronic systemic disease (%)	78 (27.1%)
Actively working individuals (%)	192 (66.7%)
Family history of active smoking (%)	224 (77.8%)
Daily cigarette consumption (1-10 cigarettes) (%)	32 (11.1%)
Daily cigarette consumption (11-20 cigarettes) (%)	158 (54.9%)
Daily cigarette consumption (20-30 cigarettes) (%)	60 (20.8%)
Daily cigarette consumption (30 or more cigarettes) (%)	38 (13.2%)

Table 2. Summary of the selection process of included and excluded participants, visually clarifying the scope and methodological approach of the study

Variable	n (%)	Statistical Significance
Smoking cessation rate of highly addicted individuals (%)	60 (20.8%)	p<0.001
Smoking cessation rate of individuals with low dependence (%)	129 (45.1%)	p<0.001
Intention to quit smoking after admission	25 (47.2%)	p<0.001
Intention to quit smoking after admission (Reference group)	—	—
Individuals who continue to smoke one week after admission	228 (79.2%)	p<0.001
Individuals who continue to smoke one week after admission (Reference group)	—	—
Smoking cessation rate in the intervention group (%)	132 (45.7%)	p<0.001
Smoking cessation rate in the control group (%)	21 (7.3%)	Reference group

Figure 1. Summary of the selection process of included and excluded participants, visually clarifying the scope and methodological approach of the study


Total patients evaluated: 20.298
With acute respiratory complaints: 2.018
Active smokers: 541
Exclusion criteria (age<18 years, ASA class III-IV patients, pregnancy, patients with cognitive impairmennt): 253
Final population: 288

At the follow-up one month later, 7.3% (n = 21) had completely quit smoking, while 9.4% (n = 27) initially quit but resumed smoking after two weeks.

The mean score received from the FTND was determined as 5.5 ± 3.8. According to the FTND score, 27.8% (n = 80) of the participants were found to have low dependence, while 18.4% (n = 53) were classified as highly dependent. These findings indicate that the smoking cessation process varies according to ND levels.

The rate of pathologic findings on physical examination was found to be statistically significantly higher in individuals who smoked 30 or more cigarettes per day compared to individuals who smoked fewer cigarettes (n = 18, 47.4%; p < 0.001). This rate was 15.2% (n = 24) in those who smoked 11-20 cigarettes daily.

When the intention of individuals with high ND according to the FTND score to quit smoking after admission due to ARI was analyzed, the rate of those who said 'I think I will quit sometime but not this time' was found to be significantly different when compared according to the level of ND. This rate was 47.2% (n = 25) in individuals with an FTND score of 8-10, 75% (n = 54) in individuals with an FTND score of 6-7, 80% (n = 64) in individuals with an FTND score of 3-4, and 64.9% (n = 24) in individuals with a FTND score of 0-2, and a statistically significant difference was found between the groups (p < 0.001).

In the evaluation one week after admission, the proportion of individuals who continued to smoke was found to be significantly higher in individuals with high FTND scores compared to other individuals (p < 0.001). It was determined that individuals with high dependence (n = 60, 20.8%) had lower smoking cessation rates than individuals with low dependence (n = 129, 45.1%).

The rate of participants who quit smoking was 45.7% (n = 132) in the intervention group and 7.3% (n = 21) in the control group. Smoking cessation rates were significantly higher in the intervention group (p < 0.001) (Table 2).

Discussion

This study investigates the efficacy of smoking cessation interventions for smokers presenting with ARI in EDs. The findings revealed multiple factors influencing cessation behavior, showing significant differences between groups.

Globally, smoking is more prevalent among men, with the highest prevalence in the 45-54 age group for men and 55-64 for women [2]. In this study, the mean age of participants was 45 years, with men comprising 72.6%. The age of smoking initiation was found to be lower in Turkey than in many developed countries, a factor that contributes to higher addiction levels later in life. The significant relationship between early smoking initiation and addiction severity underlines the importance of preventive measures for younger populations.

Family and social environments play a role in smoking behavior. The study found that 77.8% of participants had active smokers in their families, consistent with literature suggesting that individuals with smoking family members or friends are more likely to smoke themselves [10, 11].

The intention to quit smoking is influenced by age, gender, ethnicity, and education. In this study, 70.8% of participants

expressed a desire to quit smoking at some point in their lives, while 21.2% decided to quit on the day of participation. Studies have shown that individuals with a higher intention to quit have lower rates of delay discounting, indicating a greater likelihood of quitting smoking [12]. The intention to quit was shown to have a significant effect on smoking cessation rates ($p < 0.001$). In the first month, smoking cessation rates were highest (50.7%), but these rates declined over time, with only 21.2% maintaining cessation at the one-week follow-up. This highlights the importance of sustained support and awareness during the cessation process. The high addiction levels and limited support were key factors contributing to lower long-term success rates. In communities, health concerns and increasing cigarette costs motivate people to quit smoking [13]. A study by Im et al. showed that individual and interpersonal triggers play a crucial role in cessation, supporting the effectiveness of motivation-driven interventions in healthcare settings [13].

ND, as measured by the FTND, was a significant predictor of cessation success. Those with high FTND scores had significantly lower cessation rates compared to individuals with lower scores ($p < 0.001$). This finding is consistent with the literature indicating that individuals with higher ND levels are less likely to quit smoking successfully [14].

Additionally, gender and age differences were noted. Women and younger individuals had lower FTND scores and higher quit rates. In contrast, older individuals and men had higher FTND scores and more difficulty quitting, emphasizing the need for tailored cessation strategies [14].

The study also examined the relationship between daily cigarette consumption and ED readmissions. A higher rate of readmission was observed among those who smoked more (16.7% for 30+ cigarettes/day). This suggests that increased cigarette consumption significantly raises the likelihood of ED visits due to health problems, confirming previous studies on chronic obstructive pulmonary disease (COPD) patients [15].

The smoking cessation rates in the intervention group were significantly higher compared to the control group ($p < 0.001$), with the intervention group showing 45.7% cessation at one month. This confirms the potential of ED-based smoking cessation interventions, especially during acute admissions due to ARI. However, the long-term sustainability of these interventions needs further investigation.

Limitations

This study is limited by its single-center design and relatively small sample size. Future multi-center studies with larger cohorts are recommended.

This study has several limitations that should be acknowledged:

1. Single-center design and limited sample size: The study was conducted in a single emergency department over a short period and with a relatively small sample size. This may limit the generalizability of the findings to other populations or healthcare settings. Multi-center studies involving larger and more diverse cohorts are needed to confirm the external validity of the results.
2. Short follow-up duration: The follow-up period was limited to one month, which may not adequately reflect the long-term sustainability of smoking cessation. Smoking relapse frequently occurs beyond the first month. Therefore, longer follow-up durations (e.g., 6 or 12 months) would provide more comprehensive insights into cessation behavior and outcomes.
3. Lack of blinding: Although randomization was performed, neither the participants nor the researchers were blinded to group allocation due to the nature of the intervention. This could have introduced performance or reporting bias that may have influenced the results. Future prospective studies can incorporate blinding and allocation concealment to prevent bias.
4. Absence of pharmacologic support: No pharmacologic treatment (e.g., nicotine replacement therapy, varenicline, or bupropion) was offered as part of the intervention. Considering that high levels of nicotine dependence negatively impact cessation success, future studies should incorporate pharmacologic support, especially for individuals with high Fagerström scores. Future research can involve comparisons including nicotine replacement therapy or certain medications plus usual therapy in comparison with counseling or interviews as a SC intervention.
5. Self-reported outcomes without biochemical verification: Smoking status during follow-up was based on self-report, without biochemical validation methods such as carbon monoxide breath testing or cotinine level analysis. This limitation may lead to reporting bias and an overestimation of smoking cessation rates.

Conclusion

In conclusion, the study underscores that smoking cessation behavior is influenced by multiple factors, including ND levels, daily consumption, and intention to quit. High ND levels are associated with lower cessation rates, while interventions in ED settings may be more effective for individuals with lower addiction levels.

Future studies should focus on long-term follow-up and larger, multi-center studies to assess the sustainability of smoking cessation interventions. Multidisciplinary approaches are essential for enhancing smoking cessation rates. Healthcare professionals must emphasize increasing the intention to quit and managing ND effectively.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or compareable ethical standards.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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